

CLAIMS

What is claimed is:

1. A system of removing carbon dioxide (CO₂) from a gas produced in energy extracting systems comprising;
a CO₂ sorbent bed including a CO₂ sorbent,
a conduit for communicating a source of gas containing CO₂ with said sorbent bed,
a conduit for communicating said sorbent bed with an outlet,
a regeneration device for evolving CO₂ from said CO₂ sorbent bed, and
at least one valve disposed to control a flow of said gas into and out of said sorbent bed.
2. The system of claim 1, wherein said sorbent is an amine/nitrile CO₂ sorbent, wherein a major portion of the amine portion of said sorbent is formed from secondary amine groups, and at least one functional nitrile group.
3. The system of claim 2, wherein said sorbent includes an amine constituent which is composed of at least 60% secondary amine groups, no more than 10% primary amine groups, and no more than 20% tertiary amine groups.
4. The system of claim 2, wherein there are a plurality of functional nitrile groups in said sorbent.
5. The system of claim 1, wherein said sorbent is a solid weak base ionic exchange resin.

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6. The system of claim 1, wherein said sorbent bed includes a plurality of amine sorbent beads, said amine sorbent beads react with said CO₂ to trap said CO₂ within said sorbent bed.

7. The system of claim 1, including a plurality of said sorbent beds and at least one of said valves operates to switch said flow of gas between said plurality of sorbent beds such that upon saturation of one of said plurality of sorbent beds another non-saturated sorbent bed is placed in communication with said flow of gas.

8. The system of claim 1, wherein said regenerative device includes a heater to heat said sorbent bed to temperatures sufficient to evolve said CO₂.

9. The system of claim 1, wherein said regenerative device includes a steam source, said steam source emitting steam into said sorbent bed to drive absorbed CO₂ from said sorbent bed.

10. The system of claim 1, wherein said regenerative device includes a vacuum source to draw said evolved CO₂ from said sorbent beds.

11. The system of claim 1, including a controller to coordinate operation of said regenerative device and said at least one valve.

12. The system of claim 1, wherein said gas stream emanates from a natural gas well.

13. The system of claim 1, wherein said gas stream is produced by burning of fossil fuels.

14. The system of claim 1, further including a cooling system operably associated with said sorbent bed to maintain a predetermined temperature within said sorbent bed during absorption of said CO₂.

15. The system of claim 1, further including a storage tank in operable communication with said sorbent bed and controlled by said at least one valve such that CO₂ evolved from said sorbent bed is drawn into said storage tank.

16. The system of claim 1, further including an exhaust conduit operably associated with said sorbent bed to carry away evolved CO₂.

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17. A method for removing carbon dioxide (CO₂) from a gas containing CO₂ extracted from an energy producing system, said method including the steps of:

- a. communicating a CO₂ sorbent bed with the gas containing CO₂.
- b. absorbing CO₂ contained within the gas with the sorbent bed;
- c. concentrating said CO₂ within said sorbent bed, and
- d. expelling said CO₂ from said sorbent bed upon reaching a predetermined concentration level of CO₂.

18. The method of claim 1, further including at least two sorbent beds such that said step (a) is further defined by placing one of said at least two sorbent beds within the flow of gas until reaching the predetermined concentration of CO₂.

19. The method of claim 17, further including the step of switching the flow of gas from one of said at least two sorbent beds upon one of said at least two sorbent beds reaches said predetermined concentration of CO₂.

20. The method of claim 18, wherein said step (d) is further defined by expelling CO₂ from said sorbent bed at the predetermined concentration of CO₂.

21. The method of claim 18, wherein said step (d) is further defined by raising a temperature of said sorbent bed above a predetermined temperature to release the CO₂ from said sorbent bed.

22. The method of claim 18, wherein said step (d) is further defined by applying steam at a temperature above a predetermined temperature to release said CO₂ from said sorbent bed.

23. The method of claim 18, wherein said step (d) is further defined by applying a vacuum to draw the expelled CO₂ out of the sorbent bed.

24. The method of claim 1, wherein said sorbent bed includes a plurality of amine sorbent beads.

25. The method of claim 18, further including switching between said at least two sorbent beds at a predetermined time interval determined to optimize concentration of said CO₂ within said sorbent bed.

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